

USDA  
NATURAL RESOURCES  
CONSERVATION SERVICE  
MARYLAND CONSERVATION  
PRACTICE STANDARD  
**DRY HYDRANT**  
CODE 432  
(Reported by No.)

**DEFINITION**

A permanent pipe assembly system installed into a water source that permits the withdrawal of water by drafting (suction).

**PURPOSE**

To provide an available water source for fire suppression via an all-weather access.

**CONDITIONS WHERE PRACTICE  
APPLIES**

This practice applies where a source of water is needed for fire suppression; there is an available water source capable of supplying 250 gallons per minute for a continuous 2-hour period; and the dry hydrant is safely accessible via an all-weather access road.

**CONSIDERATIONS**

1. Effect on a pond, lake, or upstream and downstream water quantity;
2. Sediment production caused by erosion during construction;
3. Effects on surface and ground water of spilled fuels and lubricants by fire trucks;
4. This practice has the potential to negatively impact National Register listed or eligible (significant) cultural resources (archaeological, historical or traditional cultural proper-

ties). It also has the potential to impact listed or eligible historic structures. Consider these factors during planning and follow the NRCS policy for cultural resources during planning, construction, and operation.

**CRITERIA**

Dry hydrants are intended to give local fire departments water supplies to fight fires. The end user is the local fire department. It is required to involve the local fire department in planning, design, and construction of these structures.

Due to sediment, debris, and low water problems, hydrants placed in streams or rivers are NOT recommended. All other pond or lake water sources in the area should be investigated and eliminated as possible sites prior to installation in a stream or river. Stream and river installations are special designs and the limitations must be documented in the operation and maintenance plan. Dry hydrants must be located in reliable water sources.

**Site Conditions**

An existing or developed all-weather access is required. Locate the hydrant as close to the water source as practical to minimize friction losses. Determine the exact location of the dry hydrant with the local fire department. Stream installations require special care and design considerations when debris, sediment, and capacity could be a design limitation.

**Permits**

Any construction activities that change course, current, or cross section of streams or rivers or affect wetlands may require permits or authorizations from the Maryland Department of the Environment and/or the U.S. Army Corps of Engineers. Obtain all applicable permits and authorizations before constructing a dry hydrant.

**Design**

It is not the intent of this standard to repeat in detail, but to comply with the National Fire Protection Association (NFPA) 1142, Standard on

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Water Supplies for Suburban and Rural Fire Fighting, specifically, Appendix B, Water Supply:

B-3 Natural Water Sources

B-4 Developed Sources of Water

B-5 Dry Hydrants

B-6 Access to Water Supplies

The information listed here shall be in addition to materials or techniques listed or described in NFPA 1142. Use MD-ENG-228 “Dry Hydrant Design” to design a dry hydrant.

The design criteria for dry hydrants on which insurance companies offer insurance premium discounts may be more stringent than those in NFPA 1142 or any listed in this standard. It is the responsibility of the landowner or operator to obtain and submit to the designer the required design criteria established by their insurance company.

### **Water Requirements**

The National Fire Protection Association (NFPA) recommends designing for a minimum pumping rate of 1000 gallons per minute (gpm).

The water source must be available year round and be capable of supplying 250 gallons per minute for a continuous 2-hour period. This is equivalent to 30,000 gallons of available water.

### **Water Supply**

The adequacy of the water supply must be determined prior to design. The quantity considered available to a dry hydrant is the available water during the 50-year drought condition minus any other water uses such as industrial or agricultural needs. In a small pond or lake in Maryland, the 50-year drought condition is estimated to be 2.5 feet below the normal pool unless local data can confirm otherwise. The adequacy of a stream flow source may be determined from regional or local stream gage data.

Discuss and reach agreement with the local fire department on any water limitations the dry hy-

drant source may have. Document limitations in the Operation and Maintenance Plan.

### **Location**

Provide a location map showing the exact site of the hydrant and vehicle access to the local fire department with a copy to the landowner. Prior to design and construction, obtain a letter of approval from the landowner to use the site 365 days per year. Install the hydrant within 10 feet of the all-weather access road. If the hydrant is installed in a pond or lake, the all-weather access and pumper connection must be higher than the design high water elevation.

### **Access**

Vehicle access to the hydrant shall have an all-weather surface, be well drained, and be at least 12 feet wide for ease of movement by personnel and equipment during an emergency. When local road traffic may be involved, an all-weather road surface adjacent to the dry hydrant and completely off the public road is recommended for safety of the emergency personnel and the public.

### **Pipeline**

The pipe size must be large enough to deliver the required capacity to the pumping station. The minimum pipeline diameter is 6 inches. Increase the pipeline diameter to decrease friction losses. Standpipes should not be designed greater than 6 inches due to the difficulty in maintaining a prime with larger diameter pipes. Larger standpipes are possible but only designed for equipment capable of priming them and special hydrant heads.

Use no more than two 90-degree elbows in the hydrant system. The pipe must be fitted with an intake screen or strainer and standard fire truck hose adapters (acceptable to the local fire department) for quick connect/release operations. The pipeline must be installed below the frost-free depth for the area. Provide a slight positive grade from the standpipe to the water source.

### **Materials**

Know the material, size, and designation of the manufactured hydrant head before specifying the kind of pipe to be used for the system. The mate-

materials must be compatible in size and designation. PVC bell and spigot pipe with rubber gasket seals is not acceptable material. The minimum pipe quality is schedule 40 or SDR 26 PVC or equivalent.

Standard thermoplastic pipe designation code for PVC pipe shall be 1120 or 1220 and for ABS pipe shall be 1316 or 2112.

Material for PVC pipe fittings shall be PVC I or PVC 12, for ABS pipe fittings, ABS II or ABS 13.

Meet the requirements specified in ASTM A 120 or in AWWA C200 for steel pipe. Conform to one of the following ASTM specifications for plastic pipe:

1. D1785, Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, 120;
2. D2241, polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40;
3. D2665, Polyvinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe Fittings;
4. D1527, Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80;
5. D2282, Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).

Conform to the requirements of the following ASTM specifications for pressure pipe fittings:

1. D2464, Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80;
2. D2466, Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40;
3. D2467, Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80;
4. D2468, Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40;
5. D2672, Joints for IPS PVC Pipe Using Solvent Cement.

Solvents for solvent-welded pipe joints shall conform to the following ASTM specifications:

1. D2235, Solvent Cement for Acrylonitrile-Butadiene-Styrene, (ABS) Plastic Pipe and Fittings;
2. D2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe Systems;
3. D2855, Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

### **Pipe Intake**

To avoid a vortex or whirlpool during pumping, locate the top of the pipe intake or strainer 2 feet below the available water elevation unless a special design is used to prevent a vortex. Support and secure the intake or strainer at least 2 feet above the pool bottom, measured from the bottom of the intake. The non-perforated portion of the inlet should extend a minimum 4 feet beyond the embankment or cut slope. The minimum amount of openings for the intake is 4 times the pipe cross sectional area. In tidal situations, low tide is the maximum available water.

### **Pump Lift**

The top of the fire truck pumping connection or centerline of pump (whichever is higher) shall be no more than 15 feet (vertically) above the lower limit of the fire protection pool or stream surface during drought conditions.

When all losses are totaled, do not exceed 20 feet Total Head Loss (THL). When totaling losses, include head loss from screens and strainers, elbows, pipeline friction, elevation (static head), and hard rubber or flexible suction hose to the fire truck.

### **Dry Hydrant Head**

Acceptable materials for the hydrant sleeve are bronze, brass, aluminum alloy or other durable, non-corrosive metal. Affix the sleeve permanently inside a PVC head using epoxy adhesive and stainless steel bolts. All hydrants require a rubber "O" ring between the threaded sleeve and PVC head.

The threads for the 6-inch sleeve on the hydrant head must be a 6-inch NHT (American National Fire Hose Thread) connection. Meet or exceed ASTM 2466 for the 6-inch hydrant head.

All hydrants shall contain a removable head strainer and stainless steel snap ring that can be removed without special tools.

Place the hydrant head approximately 2 feet above the ground surface, but never higher than the intake of the pumper-truck. Install a brace post 3 to 4 feet in front of the hydrant head to bear the weight of the hard suction line between the pumper and the hydrant head. (The brace post will also serve as a guard against accidental damage to the hydrant by vehicles or other equipment.) The weight of the hard suction line full of water can crack the standpipe, particularly during extremely cold weather.

### **Dry Hydrant Cap**

The cap may be threaded or snap-on/snap-off design and permanently attached to the dry hydrant head by a steel cable or chain. The hydrant head may not be tapped by screws or other devices used to attach the cap to the hydrant head. The cap shall be hard plastic or of the same metal as the NHT connection for maximum corrosion resistance.

### **Intake Strainer**

The intake strainer material shall be compatible with the pipeline with a minimum open area of 4 times the pipe cross sectional area. Do not exceed 3/8-inch diameter inlet holes. All components, including pins, are to be non-corrosive.

A strainer may be formed by drilling 1/4 inch to 3/8-inch diameter holes with a minimum of one hole diameter between the holes. Deburr the drill holes and clean the pipe before putting the strainer into service. Cap the strainer with a "flap type" end cap allowing the system to be back flushed prior to operation.

### **Safety**

Address the following when planning, constructing and operating dry hydrants:

1. Locate and notify all overhead and underground utility companies prior to excavation and consider utilities during the planning of the access;
2. Place the dry hydrant far enough away from the water's edge or steep banks to prevent hazardous situations during use or maintenance;
3. Shape pond banks to 2:1 slopes or flatter to prevent under cutting;
4. Any excavation along streams or ponds has a high potential for trench cave-ins. Most of these excavations will have water in the trench creating unstable trench walls. If workers must enter the trench no matter what the depth, which should be a rare occasion or never, follow OSHA 1926, Excavation Regulations;
5. The placement technique in NFPA 1142, excavating from the riser to water source, is the recommended technique.

### **Site Stabilization**

All surfaces exposed during construction shall be vegetated or otherwise provided with cover to prevent erosion. Vegetative stabilization shall be in accordance with the Maryland conservation practice standard for Critical Area Planting (Code 342).

Measures shall be taken during construction to minimize soil erosion and pollution of downstream water resources. These measures may include components such as silt fences, straw bale barriers, temporary vegetation, and mulching.

### **SPECIFICATIONS**

Prepare plans and specifications for the specific field conditions based on this standard. Include a cover sheet with a site location, profile of the dry hydrant and supply line detailing ground and design elevations, materials list, material specifications, construction details and specifications, installation requirements, and a sequence of construction activities.

### **OPERATION AND MAINTENANCE**

The operation and maintenance for the system is the responsibility of the landowner and fire department. NFPA 1142 Section B-5-3, Maintenance of Dry Hydrants, suggests in detail how to operate and maintain such a water supply system. In the Operation and Maintenance Plan, include a letter of approval from the landowner to the local fire department for 365-day use and access at any hour of the day.

The following items are included here to emphasize their importance.

1. Keep the hydrant and all-weather road clear of snow and/or debris and in good repair;
2. Keep trees and underbrush trimmed away from the hydrant and all-weather road;
3. Hydrants need to be flushed and tested as per NFPA-1142 recommendations under B-5.4 Maintenance of Dry Hydrants.

## **SUPPORTING DATA AND DOCUMENTATION**

### **Field Data and Survey Notes**

Record on survey note paper, SCS-ENG-28 & 29, the following minimum data:

1. Plan view sketch of system;
2. Survey of site, including bank, bottom and water surface elevations, access area and hydrant location;
3. Data on water source.

### **Design Data**

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see Chapter 5 of the EFH, Part 650. The following is a list of the minimum required design data:

1. Locate practice on farm plan map in case file;
2. Plan view including location map, system components, profile of hydrant, construction details, material and construction specifications;
3. Design and details of access;
4. Determine 50-year drought elevation;
5. Determine minimum needed water intake;
6. Design Sheet MD-ENG-228;
7. Show job class on plan;
8. Quantities estimate;
9. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard for Critical Area Planting, Code 342. Show on plan.

### **Construction Check Data/ As-Built**

Record on survey notepaper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for As-builts:

1. Documentation of site visits on CPA-6. Include the date, who performed the inspection, specifies as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Check notes recorded during or after completion;
3. Elevations and lengths of hydrant control features and access;
4. Final quantities and documentation for quantity changes, and materials certification;
5. Sign and date check notes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice standards.

## **REFERENCES**

1. Insurance Services Office, Inc. (ISO) 545 Washington Boulevard Jersey City, NJ 07310-1686.
2. National Fire Protection Association, (NFPA) *Standard on Water Supplies for Suburban and Rural Fire Fighting*, NFPA 1142-1999;
3. USDA, Natural Resources Conservation Service, *Dry Hydrant Planning Information and Design*, MD-ENG-228.